LeviMUREP Precollege Summer Institute (MUREP PSI) Awards – FY2023

Title: Collaborative Interactive Data Science Academy

Institution: Meharry Medical College

City/State: Nashville, Tennessee

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FY: 2023

Summary:
The Collaborative Interactive Data Science Academy is a discovery-based summer experience than implements Virtual/Augmented/Mixed Reality (VR/AR/MR) control of robotic systems that deploys NASA geospatial and extra-terrestrial big data. This summer experience will expose high school student to NASA research and data science tools. The key objective of the program is to stimulate curiosity in the cross-cutting field of data science and emerging technologies through a discovery-based summer immersion program. Program activities will build statistical and critical thinking skills while inspiring and diversifying the next generation of explorers, researchers, and data scientists.

Today's world presents many challenges related to efficient guidance navigation and control of robotic platforms in terrestrial/subterranean/extra-terrestrial environments. In response to this challenge, the Meharry Medical College (MMC) School of Applied Computational Sciences (SACS) and Fisk University, two neighboring HBCUs propose to develop The SACS Summer Collaborative Interactive Data Science Academy: Promoting Data Science with VR/AR/MR Robotics and NASA Geospatial and Extraterrestrial Big Data for Grades 9-12, a 2023-2027 summer residential The proposed program includes the STEM disciplines of data science, computer vision, robotic guidance, navigation, and control; sensors; remote sensing; environmental monitoring; image processing and understanding; cybersecurity, machine learning, and data mining. We propose to develop a summer youth program based on data science-driven, hands-on, STEM activities deploying state-of-the-art VR/AR/MR systems (such as Microsoft HoloLens) driven collaborative simulations related to various NASA missions. During that activity, students will collaboratively interact with a combination of NASA data and virtual objects in a gaming form. Robotics demonstrations and an introduction to spatial data will be provided. Shuttle Radar Topographic Mission (SRTM), Landsat Earth Observation System, and Mars Rover Data will also be introduced to students as samples of NASA data that enable robots to operate on Earth and Mars. As part of their two-week data science immersion, students will design a path for the robot on Mars to assist NASA Ingenuity in repairing a propeller blade (unexpectedly broken during a Mars surface landing). Students will also enjoy hands-on activities and apply data to produce 3D models from smartphone and quadcopter-obtained imagery to bridge the connection between the virtual and physical world (reinforcing computer vision, image processing, spatial positioning, and autonomous navigation). Special consideration will be given to the introduction of cybersecurity importance for those potential missions. A combination of astronomical observations with VR/AR/MR is also considered an evening/night activity.

The five consecutive summer programs (2023-2027) will also include presentations by NASA and industry subject-matter experts and field trips to potential STEM career organizations. We will also communicate with program alumni after program implementation; an objective is to develop quantitative program success indicators expressed as a number of program alumni who enrolled in STEM educational programs as a result of their NASA PSI experience.

The significance of the summer immersion program includes:

- Increasing STEM awareness and knowledge (especially with robotics, computer, and data science);
- Increasing preparation for matriculation into an undergraduate STEM degree program;
- Creating roadmaps to a SACS for a graduate degree in data science
- Providing unique, on-campus academic research and discovery experiences that promote individual and team learning; and
- Increasing awareness of STEM career trajectories.